Acromag®

Series PMC-CX
Virtex-2 Based FPGA
PMC Module

Using the PMC-CX Engineering Design Kit

ACROMAG INCORPORATED
30765 South Wixom Road
P.O. BOX 437
Wixom, MI 48393-7037 U.S.A.

Tel: (248) 295-0310
Fax: (248) 624-9234

8500-807-C10G009

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OBJECTIVE

The purpose of this document is to provide basic instructions on using the “PMC-CX Engineering Design Kit” with the PMC-CX Boards. It will focus on programming the FPGA of the PMC-CX1002 using VHDL, but can be easily modified to use with any model of the CX line. This document also shows how to use the supplied dll files with a MFC application. It is assumed that the user has a working knowledge of Xilinx, VHDL and Visual C++.

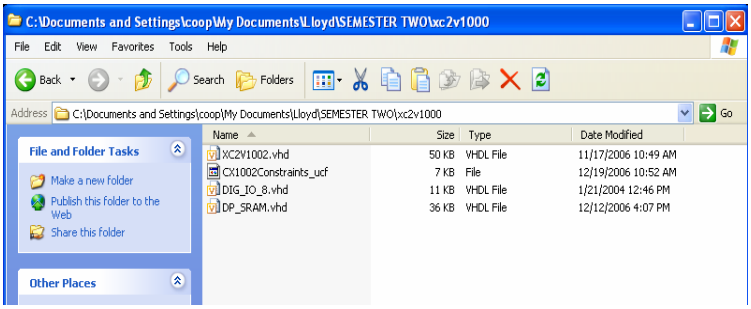
Getting Started

When using the any CX board besides the CX1002 simply substitute its model number for the “CX1002” through out this document.

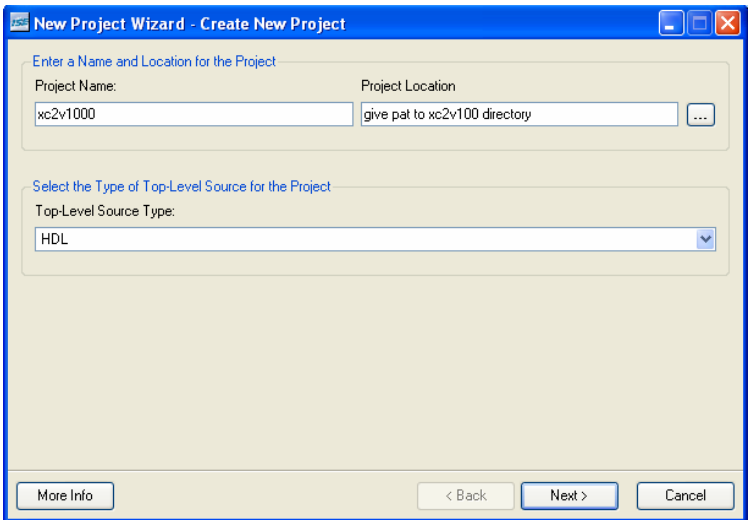
Turn off your computer, and unplug the power cord. Before touching either board, make sure to discharge all static electricity. Then attach the CX1002 to the APC-PMC board. Insert the APC-PMC into an empty PCI Bus in your computer. When restarting your computer, you will be prompted to insert a CD with the drivers on it. At this point, insert the CD **PCI Win32 Driver Software** into your CD-ROM drive. When the plug and play installation has completed, follow the steps to install the PCISW-API-WIN software on your computer. When finished, insert the CD titled **PMC-CX Engineering Design Kit** and copy the **CX1002** folder to your computer.

Before you start, read through the **Readme_CX1002.txt** file found in the **CX1002 Folder** of the PMC-CX Engineering Design Kit. Also, familiarize yourself with the **PMC-CX1002 User’s Manual** and the **PCICX Function Reference** included on the PCI Win32 Driver Software CD. The user’s manual gives the memory addresses of all the registers, and their purposes. The function reference gives information on how to use the DLL file in C/C++, Visual Basic, and LabView (we will be focusing only on using the C/C++ demo program).

Configuring Xilinx



1. Make a new directory and call it **xc2v1000**.
2. From the **CX1002\VHD Files** folder, copy the all the vhdl files in into the **xc2v1000 folder**. Then from the **CX1002** folder copy the **CONSTRAINTS.ucf** file to the **xc2v1000** folder.

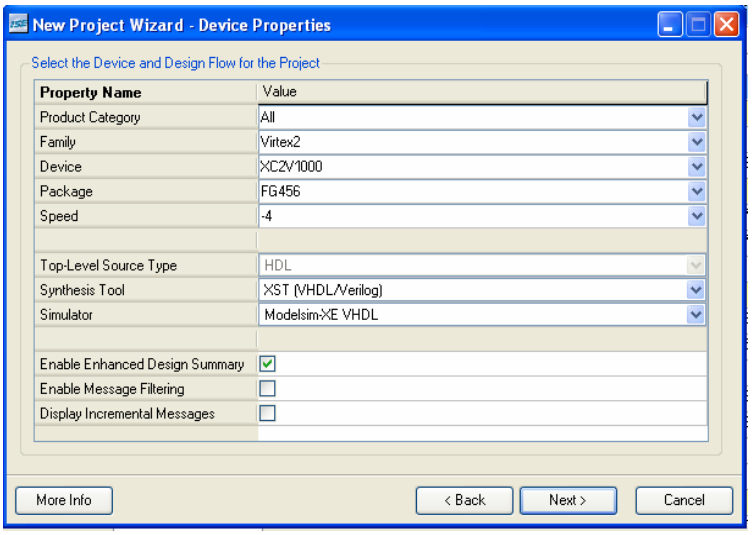


3. Start Xilinx’s Project Navigator from your start menu.
4. Open a new project by selecting **File → New Project**.
5. In the **Project Name** field, type **xc2v1000.** In the **Project Location** field type the path name where to find the xc2v1000 folder. Make sure the **Top-Level Module Type** field is **HDL**, and click **Next**.

6. Enter the following information if using the CX1002:

Device Family:	Virtex2
Device:	xc2v1000
Package:	fg456
Speed Grade:	-4
Top-Level Module:	HDL
Synthesis Tool:	XST
Simulator:	Modelsim-XE VHDL

Then click **Next**.

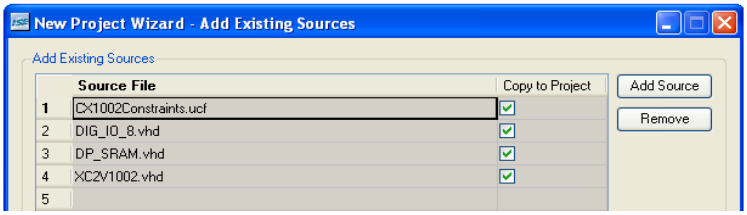


7. In the **Create New Source** dialogue box, click **Next** to go on the following screen (we will not be creating a new source at this time).

8. We will next add the files we copied from the CD. Follow these steps:

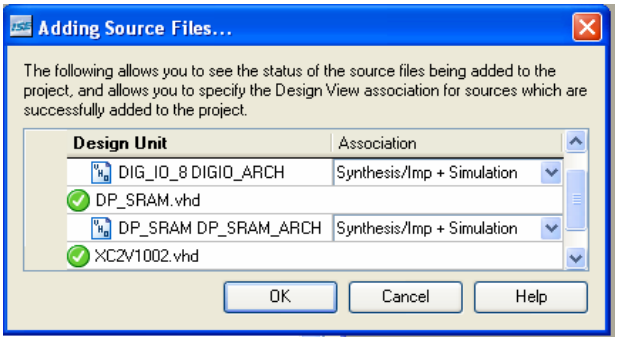
A. Press the **Add Source…** Button
B. Press **Ctrl-A** to select all of the files.
C. Press on the **Open** Button.
D. Every .ucf and .vhd files should be included.

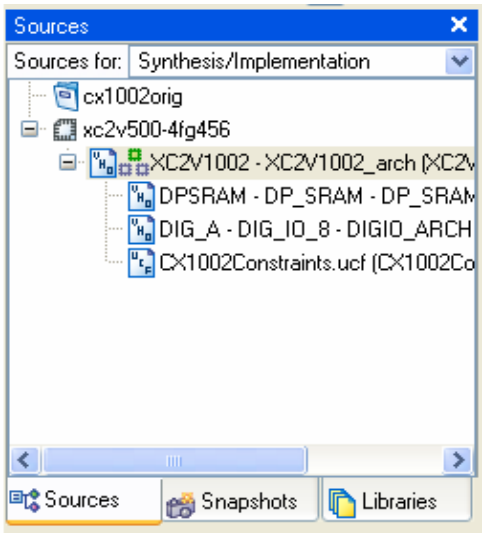
Make sure that every **Copy to Project** check boxes are deselected, and then click on **Next**.



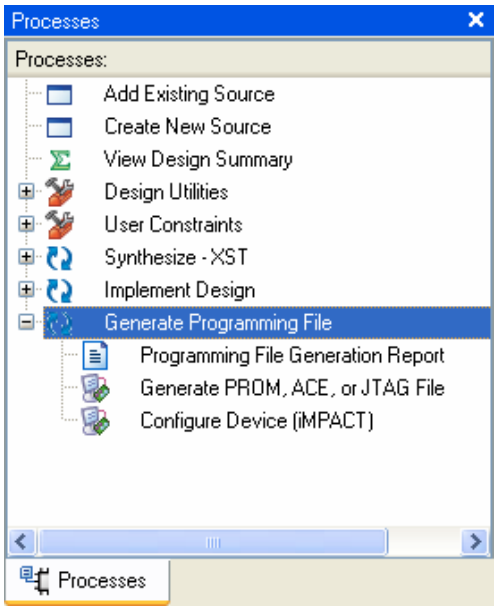
9. Review the specifications to make sure they are correct, and then click **Finish**.

10. Make sure that all of the files were added successfully and click on **OK**.





11. In the **Sources Window**, click on **XC2V1002-XC2V1002_arch (XC2V1002.vhd)** to highlight it.



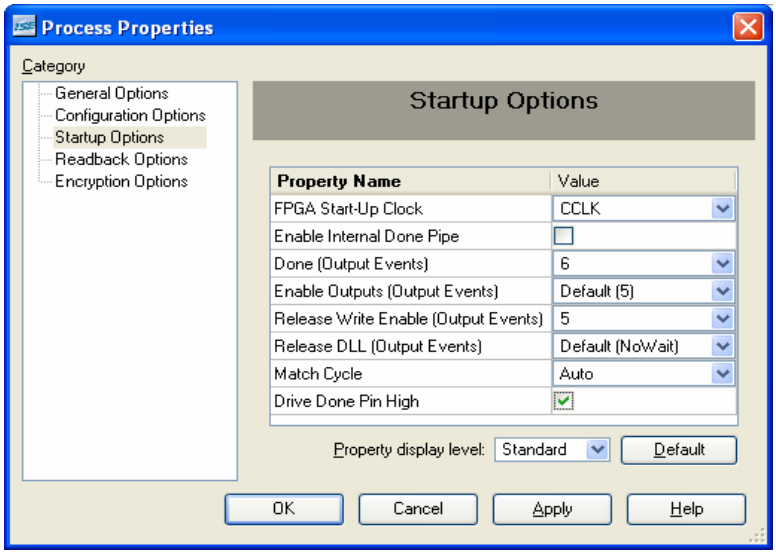
12. In the **Processes Window**, click on **Generate Programming File** so it is also highlighted.

13. Click on **Process** from the menu bar, and click on **Properties**.

14. Click on the **Startup Options** tab.

15. Verify that the following options are selected:

FPGA Start-Up Clock:	CCLK
Enable Internal Done Pipe:	Not Checked
Done:	6
Enable Outputs:	(Default) 5
Release Write Enable:	5
Release DLL:	Default
Match Cycle:	Auto
Drive Done Pin High:	Check



16. Click on the **Configuration Options** tab.

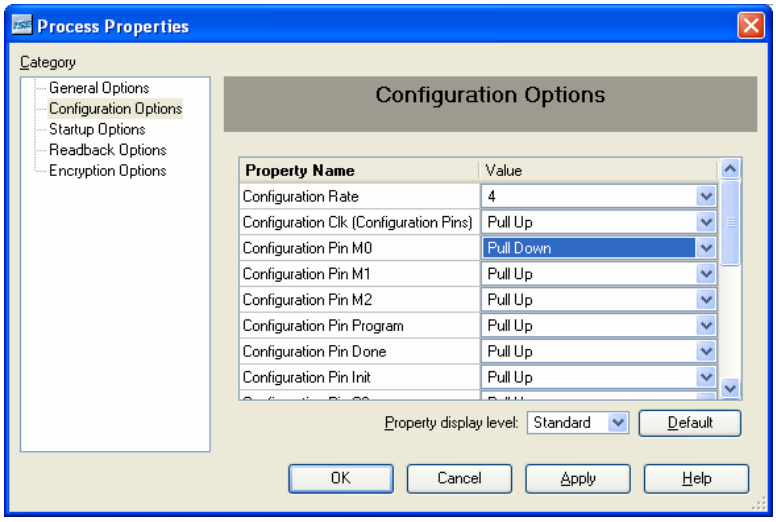
17. Change only the following option:

    Configuration Pin M0: Pull Down

    All other settings should stay the same

    Click on **OK**.

    Xilinx should now be completely configured.



Adding To The Provided VHDL Code

```
256
257  --**Insert Components Declarations:
258  -- between the 'architecture' and 'begin' keywords**
259  -- DCM is an another VHDL file to allow
260  -- different generic statements
261
262  component BUFG
```

1. To revise or add to the provided VHDL code, begin by double clicking on the **XC2V1002-XC2V1002_arch (XC2V1002.vhd)** file located in the **Sources** window. This will open the VHDL file for editing.

2. Under the commented code (line 261) additional components and signals may be added.

```
400  end component;
401
402
403  begin
404
405  DPSRAM: DP_SRAM
406    port map (
```

3. After the **begin** keyword (line 403) additional instantiations for components may be added. In this guide, we will only be adding signals. No components will be added at this time.

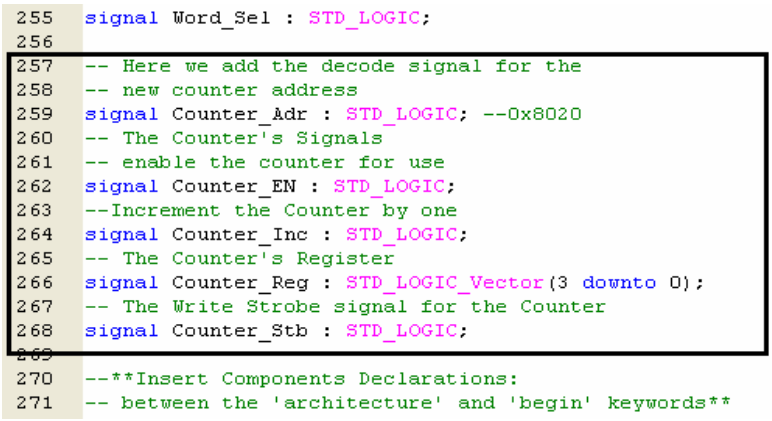
4. For simplicity we suggest adding to or revising the provided VHDL code that is associated with the I/O. To use the rear I/O, begin by double clicking on the **XC2V1002-XC2V1002_arch (XC2V1002.vhd)** file located in the **Sources** window if it is not already opened. This will open the VHDL file associated with the rear I/O for editing.

Note: It is good programming practice to group like segments together to avoid confusion later when editing code.

Example Use of the VHDL Code

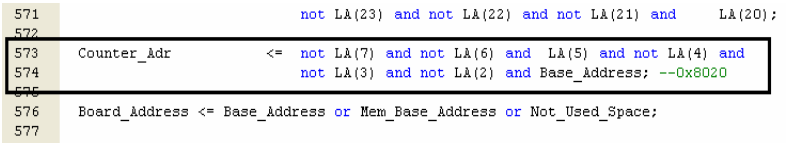
Below is a simple example of some VHDL that could be used to control five of the CX1002's LVTTL channels. It is included to show how the code supplied with the Engineering Design Kit can be modified for personal use.

1. Open **XC2V1002.vhd** and scroll down to **line 256**. We will be adding the signals (registers that the counter will be using. **Counter_EN** will enable the counter, **Counter_Inc** will determine if the counter is incrementing or not, and **Counter_Reg** is the binary counter. Add the lines in the box on the right. This code will create a new address strobe for the counter. It will be located in register 0x8020.



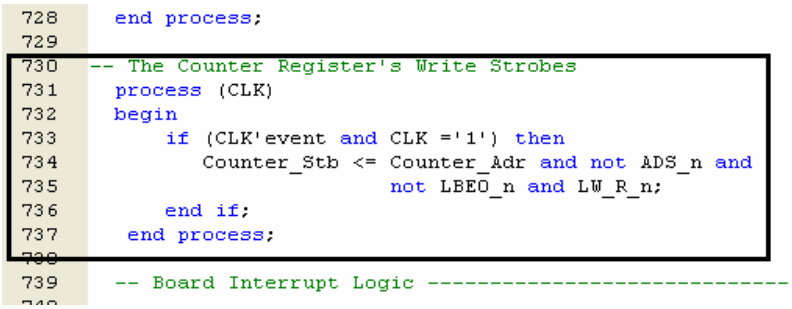
```
255  signal Word_Sel : STD_LOGIC;
256
257  -- Here we add the decode signal for the
258  -- new counter address
259  signal Counter_Adr : STD_LOGIC; --0x8020
260  -- The Counter's Signals
261  -- enable the counter for use
262  signal Counter_EN : STD_LOGIC;
263  --Increment the Counter by one
264  signal Counter_Inc : STD_LOGIC;
265  -- The Counter's Register
266  signal Counter_Reg : STD_LOGIC_Vector(3 downto 0);
267  -- The Write Strobe signal for the Counter
268  signal Counter_Stb : STD_LOGIC;
269
270  --**Insert Components Declarations:
271  -- between the 'architecture' and 'begin' keywords**
```

2. We will now replace a previously unused memory address. **Add** the two lines of code as shown to the right at **line 573**. This will be the location in memory to access the counter.



```
571                          not LA(23) and not LA(22) and not LA(21) and     LA(20);
572
573  Counter_Adr          <=  not LA(7) and not LA(6) and  LA(5) and not LA(4) and
574                           not LA(3) and not LA(2) and Base_Address; --0x8020
575
576  Board_Address <= Base_Address or Mem_Base_Address or Not_Used_Space;
577
```

3. At **line 730** we will insert the counter's write strobe. This will pulse **Counter_Stb** when there is a write command to the **Counter_Adr**. **Add** the lines of code as shown.



```
728    end process;
729
730  -- The Counter Register's Write Strobes
731    process (CLK)
732    begin
733        if (CLK'event and CLK ='1') then
734           Counter_Stb <= Counter_Adr and not ADS_n and
735                          not LBE0_n and LW_R_n;
736        end if;
737     end process;
738
739    -- Board Interrupt Logic ----------------------------
```

```
871  process (CLK, RESET)
872  begin
873      if (RESET = '1') then
874         DirCtrl(7 downto 0) <= "00000000";
875      elsif (CLK'event and CLK = '1') then
876         if (Direction_Stb0 = '1') then
877            DirCtrl(7 downto 0) <= LD(7 downto 0);
878        -- If there is a Counter_Stb pre-config the direction
879        -- to channel 4 as an input and channels 3-0 as outputs
880        elsif (Counter_Stb = '1') then
881      DirCtrl(7 downto 0) <= "00001111";
882         else
883            DirCtrl(7 downto 0) <= DirCtrl(7 downto 0);
884         end if;
885      end if;
886  end process;
887
```

4. At **line 871** there is the process statement to control the Differential Direction Control Register. Add the red code to cause channels 0-3 to become outputs when there is a write to the counter address, and make sure that channel 4 is an input to handle the increment line.

```
930  -- The Counter_EN Register 0x8020 bit 5
931  -- turns on the functionality of the Counter
932   process (CLK, RESET)
933   begin
934       if (RESET ='1') then
935          Counter_EN <= '0';
936       elsif (CLK'event and CLK ='1') then
937          if (Counter_Stb ='1') then
938             Counter_EN <= LD(5);
939          else
940             Counter_EN <= Counter_EN;
941          end if;
942       end if;
943    end process;
```

5. The enable for the counter will be handled in the process statement at **line 930**. Notice that **Counter_EN** receives its information from the local data bus (LD) bit-5. **Add** the code shown on the left.

```
944
945    -- Counter_Inc determines when to load the counter
946    -- register 0x8020 bit 4
947    process (CLK, RESET)
948    begin
949       if (RESET ='1') then
950          Counter_Inc <= '0';
951       elsif (CLK'event and CLK = '1') then
952          if (Counter_EN = '1') then
953             Counter_Inc <= LD(4);
954          else
955             Counter_Inc <= Counter_Inc;
956          end if;
957       end if;
958    end process;
959
```

6. The external increment line for the counter will be handled in the process statement at **line 945**. Notice that the **Counter_Inc** receives its information from channel 4. The counter is stopped and started using this input line. **Add** the code to the left directly following the code added in step 5.

7. The counter will be handled in this process statement. When the counter is enabled, it will check the Counter_Inc line to see if it has a positive logic equivalence of '1' every positive clock edge. If it does then the counter will be incremented. Add this code beginning at **line 960**.

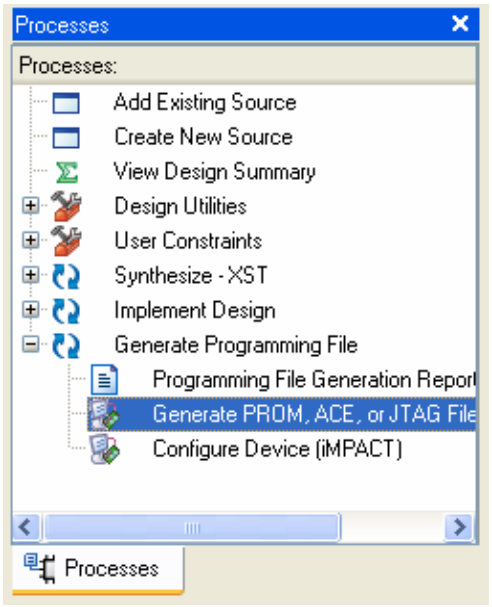
```
959
960     -- Counter_Reg determine when to increment the counter
961     process (CLK, RESET)
962     begin
963        if (RESET ='1') then
964           Counter_Reg <= "0000";
965        elsif (CLK'event and CLK = '1')then
966           if (Counter_EN = '1' and Counter_Inc = '1') then
967              Counter_Reg <= Counter_Reg + 1;
968           else
969              Counter_Reg <= Counter_Reg;
970           end if;
971        end if;
972     end process;
973
```

8. Add the following lines of red code to the **READ_DATA MUX** lines beginning about **line 1018**. This will allow the read and write commands to access the counter address at 8020H.

   Bits 3-0 will hold the four bits of the counter, bit 4 will hold the increment line, and bit 5 will hold the enable.

```
1017
1018  RD_Data(0) <=  (Counter_Reg(0) and Counter_Adr) or
1019                 (BREQo and Reset_Reg_Adr) or
1020                 (DMA_Request0 and DMA_Control_Adr) or
1021                 (IntStatA(0) and Int_StatClear_Adr) or
1022                 (IO0_ON and DigReg31to0_Adr) or
1023           (DirCtrl(0) and  Direction_Adr) or
1024           (IntEnA(0) and  Int_Enable_Adr) or
1025           (IntTypA(0) and  Int_Type_Adr) or
1026           (IntPolA(0) and  Int_Polarity_Adr) or
1027           (DMA_TS(0) and DMA_TS_Adr) or
1028           (DMA1_TS(0) and DMA1_TS_Adr) or
1029           (SRAM_RdData(0) and SRAM_Strobe);
1030
1031  RD_Data(1) <=  (Counter_Reg(1) and Counter_Adr)  or
1032                 (LINTo_n and Reset_Reg_Adr) or
1033                 (DMA_Request1 and DMA_Control_Adr) or
1034                 (IntStatA(1) and Int_StatClear_Adr) or
1035                 (IO2_1N and DigReg31to0_Adr) or
1036           (DirCtrl(1) and  Direction_Adr) or
1037           (IntEnA(1) and  Int_Enable_Adr) or
1038           (IntTypA(1) and  Int_Type_Adr) or
1039           (IntPolA(1) and  Int_Polarity_Adr) or
1040           (DMA_TS(1) and DMA_TS_Adr) or
1041           (DMA1_TS(1) and DMA1_TS_Adr) or
1042           (SRAM_RdData(1) and SRAM_Strobe);
1043
1044  RD_Data(2) <=  (Counter_reg(2) and Counter_Adr) or
1045                 (LSERR_n and Reset_Reg_Adr) or
1046                 (USER0 and DMA_Control_Adr) or
1047                 (IO4_2N and DigReg31to0_Adr) or
1048                 (IntStatA(2) and Int_StatClear_Adr) or
1049           (DirCtrl(2) and  Direction_Adr) or
1050           (IntEnA(2) and  Int_Enable_Adr) or
1051           (IntTypA(2) and  Int_Type_Adr) or
1052           (IntPolA(2) and  Int_Polarity_Adr) or
1053           (DMA_TS(2) and DMA_TS_Adr) or
1054           (DMA1_TS(2) and DMA1_TS_Adr) or
1055           (SRAM_RdData(2) and SRAM_Strobe);
1056
1057  RD_Data(3) <=  (Counter_Reg(3) and Counter_Adr) or
1058                 (IO6_3N and DigReg31to0_Adr) or
1059                 (IntStatA(3) and Int_StatClear_Adr) or
1060           (DirCtrl(3) and  Direction_Adr) or
1061           (IntEnA(3) and  Int_Enable_Adr) or
1062           (IntTypA(3) and  Int_Type_Adr) or
1063           (IntPolA(3) and  Int_Polarity_Adr) or
1064           (DMA_TS(3) and DMA_TS_Adr) or
1065           (DMA1_TS(3) and DMA1_TS_Adr) or
1066           (SRAM_RdData(3) and SRAM_Strobe);
1067
1068  RD_Data(4) <=  (Counter_Inc and Counter_Adr) or
1069                 (IO8_4N and DigReg31to0_Adr) or
1070                 (IntStatA(4) and Int_StatClear_Adr) or
1071           (DirCtrl(4) and  Direction_Adr) or
1072           (IntEnA(4) and  Int_Enable_Adr) or
1073           (IntTypA(4) and  Int_Type_Adr) or
1074           (IntPolA(4) and  Int_Polarity_Adr) or
1075           (DMA_TS(4) and DMA_TS_Adr) or
1076           (DMA1_TS(4) and DMA1_TS_Adr) or
1077           (SRAM_RdData(4) and SRAM_Strobe);
1078
1079  RD_Data(5) <=  (Counter_EN and Counter_Adr) or
1080                 (IO10_5N and DigReg31to0_Adr) or
1081                 (IntStatA(5) and Int_StatClear_Adr) or
1082           (DirCtrl(5) and  Direction_Adr) or
1083           (IntEnA(5) and  Int_Enable_Adr) or
1084           (IntTypA(5) and  Int_Type_Adr) or
1085           (IntPolA(5) and  Int_Polarity_Adr) or
1086           (DMA_TS(5) and DMA_TS_Adr) or
1087           (DMA1_TS(5) and DMA1_TS_Adr) or
1088           (SRAM_RdData(5) and SRAM_Strobe);
1089
```

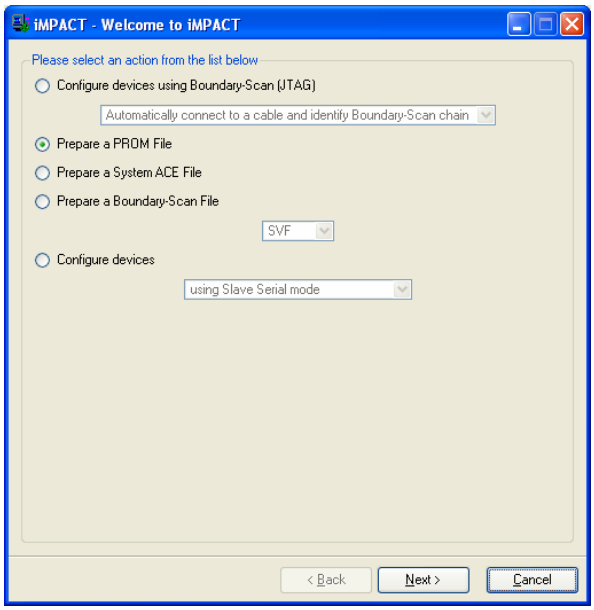
Create A Program Hex File



1. Select **XC2V1002-XC2V1002_arch (XC2V1002.vhd)** in the **Sources Window**.
2. Select **Generate PROM, ACE, or JTAG File** in the **Processes Window**.
3. Right-click on **Generate PROM, ACE, JTAG File,** and click on **Rerun all**.

   Note: If there are any errors, correct them and repeat steps 2 and 3.

4. A black prompt screen may appear for a few seconds after step 3. Ignore this screen and DO NOT type inside it.

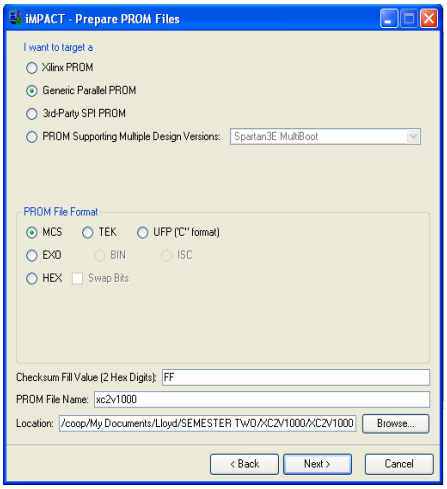


5. Select **Prepare a PROM File** and click **Next**

6. Enter the following information:

Select:	Generic Parallel PROM
PROM File Format:	MCS
Memory Fill Value:	FF
PROM File Name:	CX1002
Location:	Path to the CX1002 file

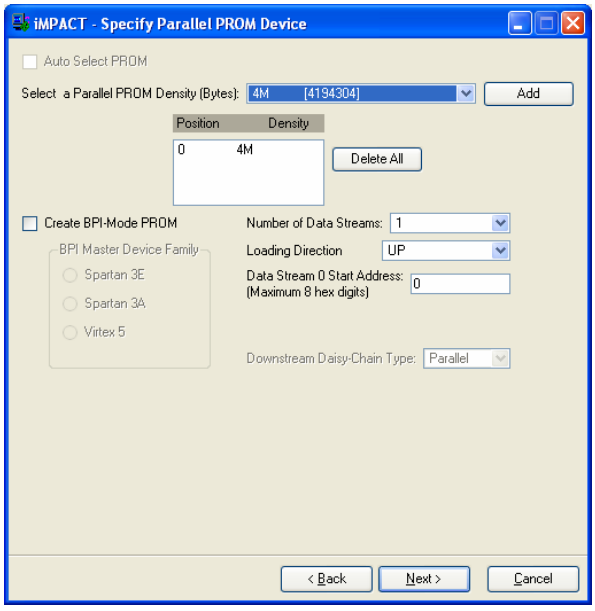
Click on **Next**.



7. Enter the following information for the LX40:

Auto Select PROM:	Unchecked
Parallel PROM Density:	4M
Number of Data Streams:	1
Loading Direction:	UP

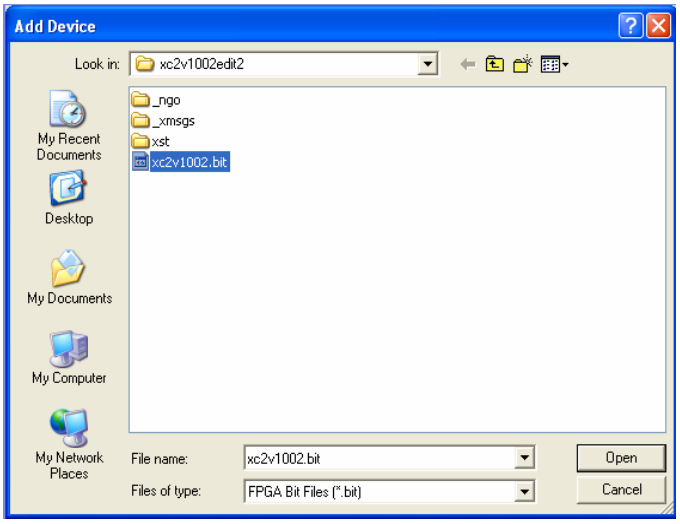
Click **Add** and the click **Next**.



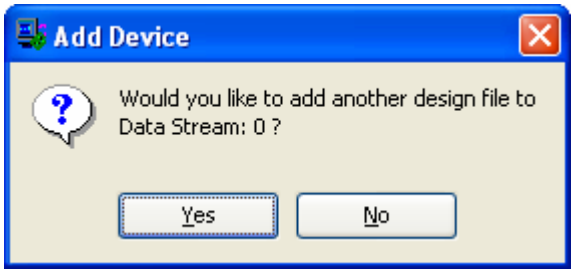
8. Click **Finish** on the following page.

9. Click on **OK** to add a device.

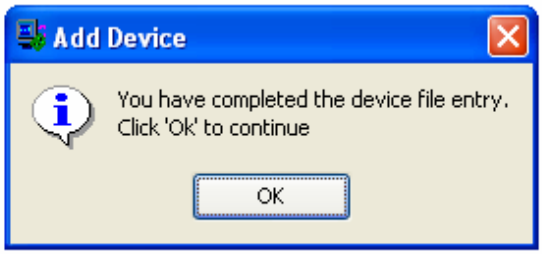
10. Select **xc2v1002.bit** and click **Open**.



11. Select **No**.

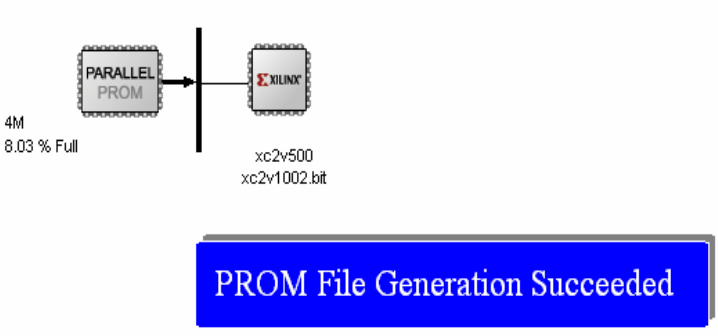


12. Select **OK**.

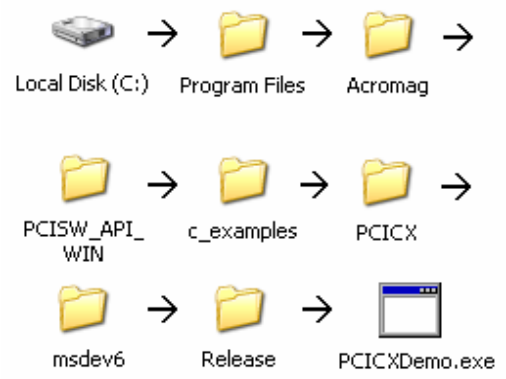


14. From the menu go **Operations ->Generate File**. A message will appear on the screen to indicate the PROM file was successfully generated.

    The .mcs file is now ready to be loaded into the CX1002.



Loading the mcs File Into the CX Board



1. Load **PCICXDemo.exe** found in PCISW_API_WIN\c_example\PCILX\msdev6\Release\ created by the PCI Win32 Driver Software CD-ROM.

   Note: The PCISW_API_WIN folder will be installed by default at C:\Program Files\Acromag\ .

```
PCICX Demonstration Program

PCICX Main Menu
-----------------------------------------
 1. Example design demo instructions
 2. Locate/Choose board
99. Exit
Enter selection:
```

2. Begin by entering **1** and reading the operating instructions.

3. Press **2** to select which type of LX board to use.

```
 1.  CX1002R
 2.  CX2002R
 3.  CX1003R
 4.  CX2003R
Select board to open:
```

4. Type in the menu number that corresponds with your board model and press **Enter**.

```
Is the FPGA configured with an Acromag example design? ('Y' or 'N'): Y
Is a mezzanine module attached? ('Y' or 'N'): Y
```

5. Answer **Y** to the first example if the FPGA is configured with the Acromag example design or the FPGA is configured with a design whose basic structure is the Acromag example design. Otherwise type **N** and press **Enter**.

6. Type **Y** if there is a mezzanine module attached (like the AXM-EDK that we are using).

7. Choose choice **4** to access the **FPGA configuration** menu.

```
PCICX Main Menu
---------------------------------------
 1. Example design demo instructions
 2. Locate/Choose board
 3. Attach interrupt callback
 4. FPGA configuration
 5. PLX9656 configuration and control
 6. Flash commands
 7. Raw memory access
 8. View status information
99. Exit
Enter selection:
```

8. Next select option **2**: **Perform direct PCI bus to Xilinx configuration.** It is recommended that you test this modified example design using the reconfiguration direct method. It is not recommended that the flash be overwritten until you have tested your code. The reconfigure direct method will allow program of the FPGA directly from the PCI bus. If for some reason the PMC CX does not perform as expected, you can power the PMC CX down. Upon power-up, the example design provided by Acromag will again be loaded into the FPGA.

```
PCICX FPGA Configuration Menu
---------------------------------------
 FPGA is currently configured
 1. Perform flash configuration
 2. Perform direct PCI bus to Xilinx configuration
99. Return to previous menu
Enter selection: _
```

9. Select **Y** if the file path given is correct, or enter the path to the mcs file we created in the last section. Answer **Y** if the computer asks if the FPGA is configured with an Acromag example design or if this is a mezzanine model. The PCICX FPGA Configuration Menu will appear after a few moments and should say “FPGA is currently configured if the CX board was loaded with the new file.

```
Use file C:\Program Files\Acromag\PCISW_API_WIN\config_files\CX1002R.mcs?
('Y' or 'N'): y

Configuring...
(This may take up to a minute.)

Is the FPGA configured with an Acromag example design? ('Y' or 'N'): y
Is a mezzanine module attached? ('Y' or 'N'): y

PCICX FPGA Configuration Menu
---------------------------------------
 FPGA is currently configured
 1. Perform flash configuration
 2. Perform direct PCI bus to Xilinx configuration
99. Return to previous menu
Enter selection: _
```

Using the Example C to Run The FPGA

```
PCICX Main Menu
---------------------------------------
 1. Example design demo instructions
 2. Locate/Choose board
 3. Attach interrupt callback
 4. FPGA configuration
 5. PLX9656 configuration and control
 6. Flash commands
 7. Raw memory access
 8. View status information
99. Exit
Enter selection:
```

1. From the **PCIAX FPGA Configuration Menu**, type **99** and press **Enter** to return to the **PCILX Main Menu**.

2. Open the **Raw memory access menu** by typing **7** and pressing **Enter**. This menu will allow us to use the built in functions to read and write to the board.

```
Select memory space to access
  1. PCIBAR0 (PLX)
  2. PCIBAR2 (CPLD, Flash, FPGA
Enter selection: _
```

3. Select **2** and press **Enter** to access the PCIBAR2 memory space where the **AXM_D registers** are located.

```
PCICX memory access menu
---------------------------------------
 1. Change transfer size: WORD (16 bit)
 2. Read from board
 3. Write to board
99. Return to main menu
Enter selection: 3

Enter offset to write to: 8020
Enter data to write WORD (16 bit):
```

4. To write to the board, Type **3** and press **Enter.**

5. Type **8020**, the hexadecimal memory address of Counter_Adr, and press **Enter**. Then enter the data to enable the counter in hex, remembering that bit 5 enables the counter, bit 4 is the increment line, and bits 3-0 are the counter.

6. This concludes the setup, and the counter should function as previously described.

Creating a MFC program to use with the CX Board

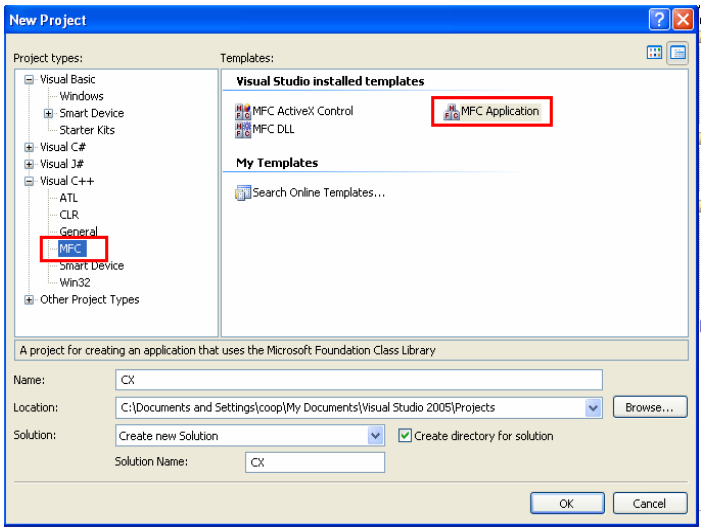
For this section a general understanding of C/C++ and the Visual Studios software is required. Even though a step by step process is given, much of the syntax may be confusing if one is not familiar to programming in Visual C++. Primarily the following sections shows how to enable use of the dll functions, while creating a simple MFC program. References to **PCICX Function Reference** and **PCI Win32 Driver User's Manual** are made throughout this section. A copy of each should be close for reference as we create the MFC executable. These files are found in PCISW_API_WIN\doc created by the PCI Win32 Driver Software CD-ROM. **Note:** The PCISW_API_WIN folder will be installed by default at C:\Program Files\Acromag\ .

1. Open Microsoft Visual Studio 2008 from the start menu. **Some screens may vary if using a different version of Visual Studios.**

2. Open a new MFC project by clicking on **File → New** and selecting **Project**.

3. Expand the **C++ tab** and click **MFC**. Under Visual Studio installed templates click **MFC Application**. Enter the **project name CX** and leave the "create directory for solution" box checked.

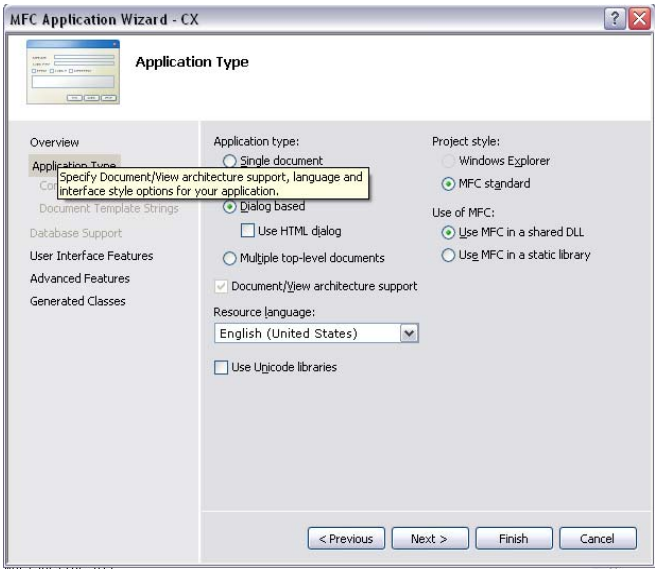
   Click OK.

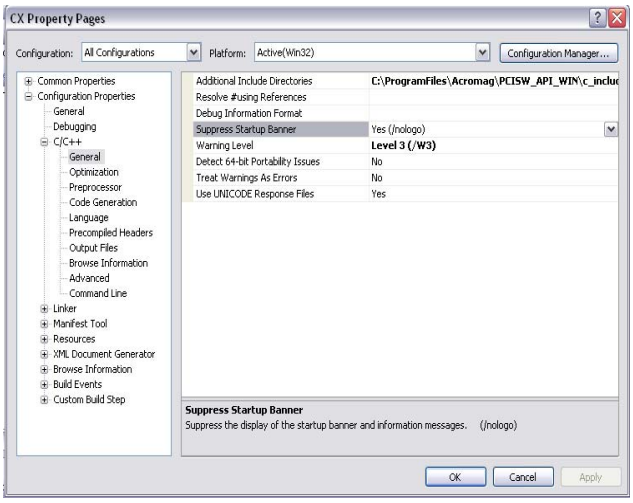


4. The **MFC Application Wizard** appears.

   Click Next. On the Application Type screen choose the **Dialog Based** option. Deselect the **Use Unicode Libraries** option. Click **Next** until the **Generated Classes** window appears; for **Generated Classes**, select CCXDlg. Then click **Finish**.

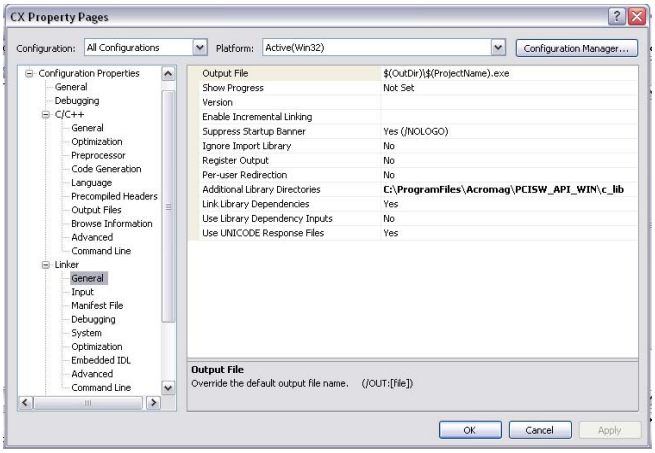
5. Open **PCI Win32 Driver Software User's Manual** to page 16. Here it gives instructions on using the dll in Microsoft Visual C++ 6. Follow along as we visually go through this process.



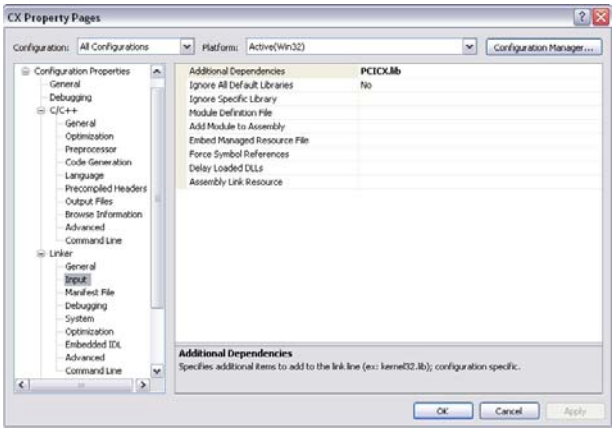


6. Select **Project** form the menu bar and click **CX Properties**.

7. Under **Configuration Properties** expand the **C/C++** tab and highlight the **General** sub-menu. Select **All Configurations** for **Configuration**. In the **Additional include directories** edit box type in the path to the c header files. If the PCI Win32 Driver Software was installed in the default location then they will be found at "**C:\Program Files\ Acromag\PCISW_API_WIN\ c_include"**.



8. Next expand the **Linker** tab and highlight the **General** sub-menu. In the **Additional library Dependencies** edit box type in the location of the above library. If the PCI Win32 Driver Software was installed in the default location then they will be found at "**C:\Program Files\ Acromag\ PCISW_API_WIN\c_lib"**.

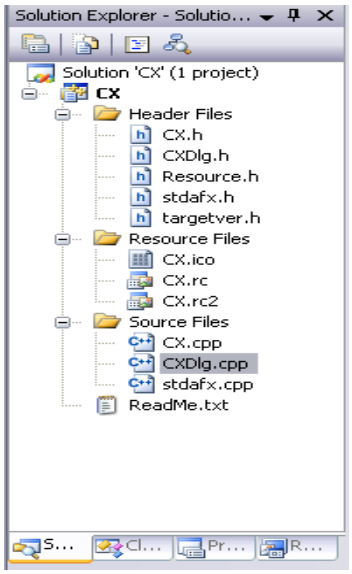


9. Highlight the **Input** sub-menu. Under **Additional Dependencies** type **PCICX.lib**.

   Click **Apply**
   Click **OK**

10. Locate the Solution Explorer Window on the bottom tabs of the screen or **View → Solution Explorer** from the main menu.

    Expand the **Source Files** tab and double click **CXDlg.cpp** to open and edit the file.



11. Add the following three lines of code directly beneath the existing "#include…" statements to produce the resulting code on the right :

```
#include <windows.h>
#include "PCICX.h"
#include "PCIErrorCodes.h"
```

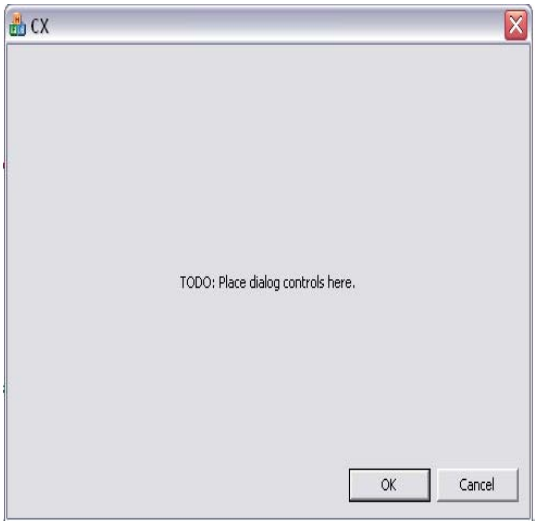
```
// CXDlg.cpp : implementation file
//

#include "stdafx.h"
#include "CX.h"
#include "CXDlg.h"
#include <windows.h>
#include "PCICX.h"
#include "PCIErrorCodes.h"


#ifdef _DEBUG
#define new DEBUG_NEW
#endif
```

12. All the dll functions should now be enabled. To check, click on the Debug Program button  at the top of the screen. Choose "Yes" if a prompt appears asking if the user would like to build files.

Note: Be sure to copy PCICX.h, PCIErrorCodes.h, and PCICX.lib into your project folder in order to execute the program. You can find these files at C:\ProgramFiles\Acromag\PCISW_API_WIN\c_include and C:\ProgramFiles\Acromag\PCISW_API_WIN\c_lib respectively.

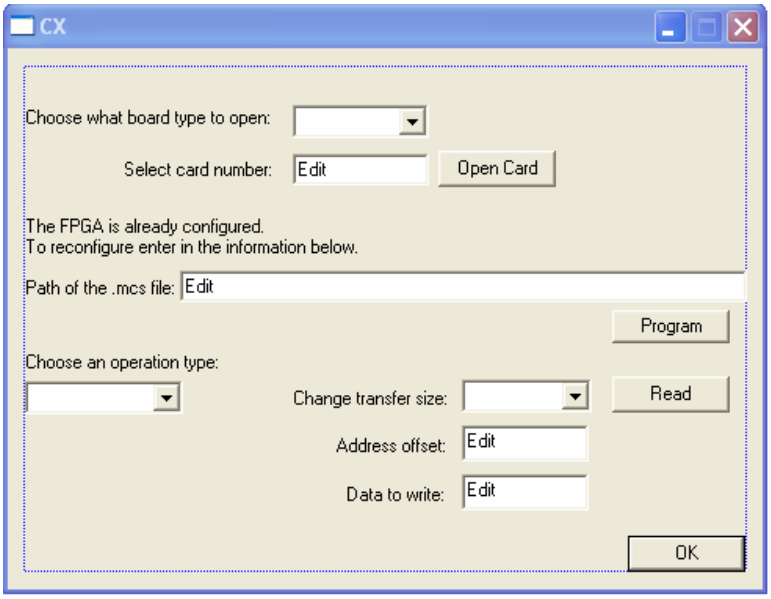


13. The example dialog program should load as shown to the left. If not, then the dll has not been configured correctly. Repeat steps 7 – 12 and make sure all the paths and file names are correct.

    Exit the dialog box by clicking **OK**.

NOTE : If you have not made any changes to the generated code other than step 11 but receive an error stating “error spawning cmd.exe” do the following :

Go to **Tools → Options**
Expand the **Project and Solutions** tab
Click on **VC++ Directories**
Add the following lines
$(SystemRoot)\System32
$(SystemRoot)
$(SystemRoot)\System32\wbem



14. In the Workspace window click on the **ResourceView** tab, expand the **CX.rc** and **Dialog** folders, and then double click on **IDD_CX_DIALOG** for editing. The dialogue editor side panel should also appear. If not, locate it from **View → Toolbars → Dialog Editor**.

15. Delete both the cancel button and the TODO static text in the example dialog program above. Then add the components listed on the following page and move the OK button.

    Make sure the **Properties** side panel is open while editing. (right click on any object and click **Properties** to open).

    When finished, the dialog box should look like the figure to the left.

Object	Control ID (under Misc. tab)	Caption (under Appearance tab)	Location
Static Text	IDC_STATIC	Choose what board type to open:	--
Static Text	IDC_MULTBRDSTATIC	Select Card Number:	--
Static Text	IDC_ISFPGACONFIG	The FPGA is already configured.\nTo reconfigure enter in the information below:	--
Static Text	IDC_PATHSTATIC	Path of the .mcs file:	--
Static Text	IDC_OPSTATIC	Choose an operation type:	--
Static Text	IDC_ADRMODESTATIC	Change transfer size:	--
Static Text	IDC_ADRSTATIC	Address Offset:	--
Static Text	IDC_WRITESTATIC	Data to write:	--
Edit Control	IDC_CRDNUM	--	Next to “select card number” text
Edit Control	IDC_FILENAME	--	Next to “path of the .mcs file” text
Edit Control	IDC_ADROFF	--	Next to “Address offset” text
Edit Control	IDC_TOWRITE	--	Next to “Data to Write” text
Button	IDC_OPENCARD	Open Card	--
Button	IDC_PROG	Program	--
Button	IDC_RORWBUTTON	Read	--
Combo Box	IDC_BRDTYPE	--	Next to “Choose what board type to open” text
Combo Box	IDC_RORW	--	Underneath “Choose an operation type” text
Combo Box	IDC_ADRMODE	--	Next to “Change transfer size” text

Note: Remember when creating the combo boxes, make sure to click and drag the area for the control as if the drop down menu is open. This is done by selecting the down arrow on the combo box.

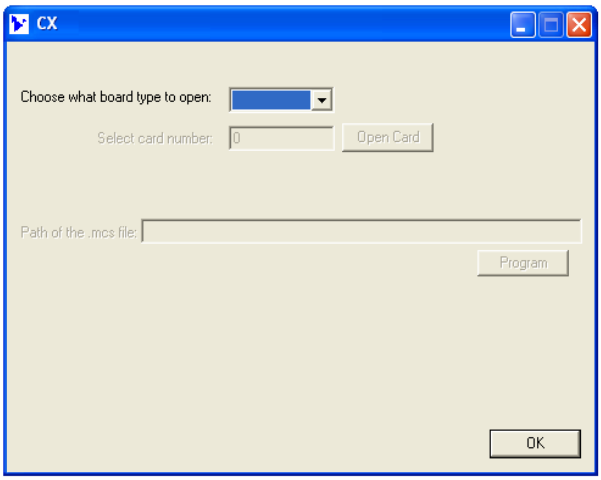
16. For each combo box right-click we need to enter the data shown in the table. Highlight **Data** under the **Behavior** tab of the **Properties** menu. Enter the information shown, using a semicolon to separate items.

17. Also, in the **Behavior** tab set the option **Sort → False**. Likewise, set **Type → Droplist**.

Combo Box ID	Data
IDC_BRDTYPE	CX1002R
	CX2002R
	CX1003R
	CX2003R
IDC_RORW	Read
	Write
IDC_ADRMODE	Byte
	Word
	DWord

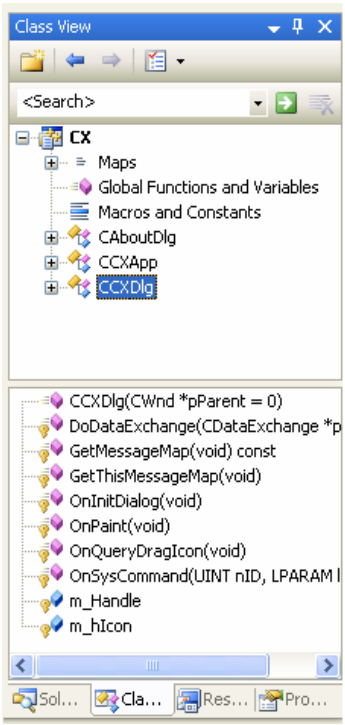
Control ID	Visible	Disabled
IDC_BRDTYPE	True	False
IDC_CRDNUM	True	True
IDC_FILENAME	True	True
IDC_MULTBRDSTATIC	True	True
IDC_OPENCARD	True	True
IDC_PATHSTATIC	True	True
IDC_PROG	True	True
IDC_STATIC	True	False

18. Set the following properties. Select a control and expand the **Behavior** tab of the properties menu to edit these options. All other controls not in this table should have their visibility set to False.



19. Click on the Debug Program button  at the top of the screen. The dialog screen should now look like this.

20. Click **OK** to close the program.



21. In the Workspace window click the **Class View** tab, and expand **CX classes**. Right-click on **CCXDlg** and click **Add → Add Variable**. Enter the following information:

Option	Value
Variable Type	Short
Variable Name	m_Handle
Access	protected

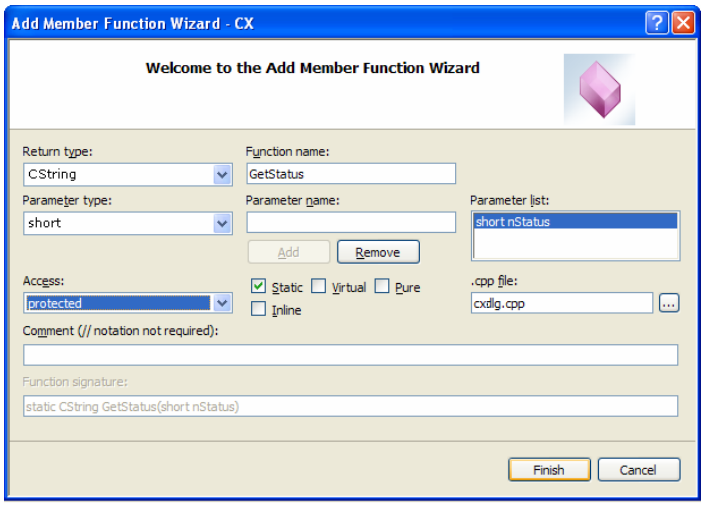
Click **Finish.**

22. Right-click on the **CCXDlg** and click **Add → Add Function** to open the "Add Member Function Wizard". Enter the following information and also select the Static option.

    Note: In the "Return Type" and "Parameter Type" fields you are able to type in the desired value if it is not contained in the drop down menu.

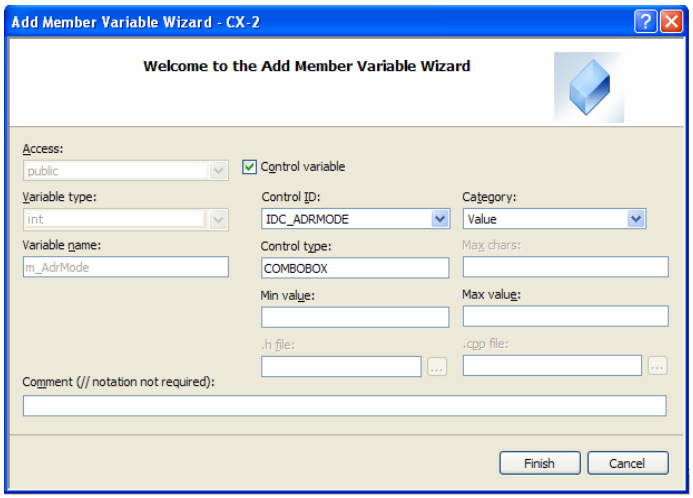
    Return Type : CString
    Function Name: GetStatus
    Parameter type: short
    Parameter name: nStatus (then click **Add**)
    Access : protected
    Static : box is checked

    Click Finish.

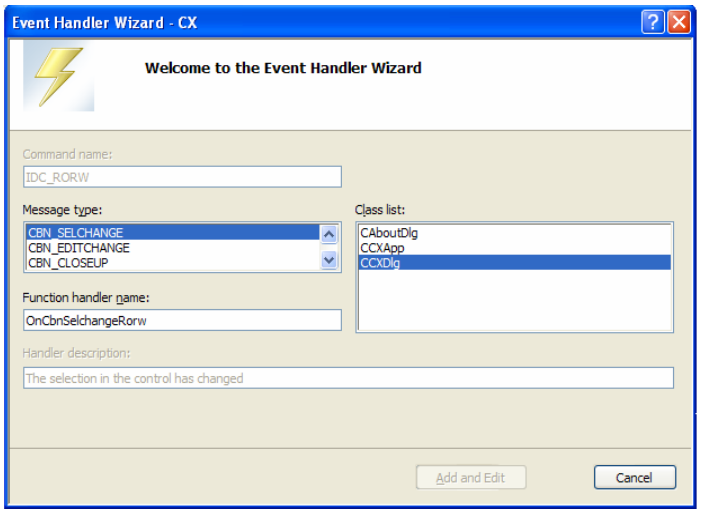


23. In the Workspace window click on the **ResourceView** tab, expand the **CX.rc** and **Dialog** folders, and then double click on **IDD_CX_DIALOG**. Member variables now need to be attached to the controls. Right click on the control to be edited and click **Add Variable** to open the **Add Member Variable Wizard**.

    First click on the **Category** dropdown and choose "**Value"**. The following options in the table then become available. Enter the values and then press **Finish.**

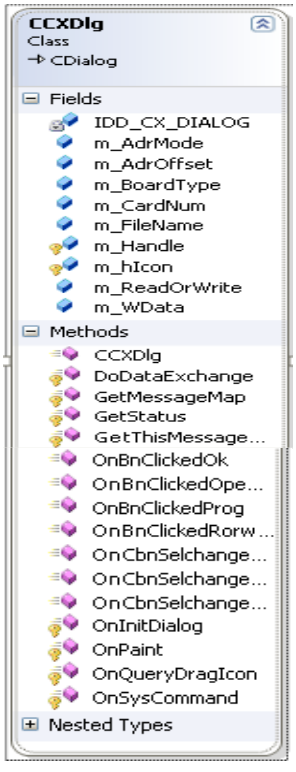


Control IDs	Variable Name:	Type
IDC_ADRMODE	m_AdrMode	Int
IDC_ADROFF	m_AdrOffset	CString
IDC_BRDTYPE	m_BoardType	Int
IDC_CRDNUM	m_CardNum	Int
IDC_FILENAME	m_FileName	CString
IDC_RORW	m_ReadOrWrite	Int
IDC_TOWRITE	m_WData	DWORD



24. Right click on the following controls and select **Add Event Handler** to assign the following messages. A default **Function handler name** is generated and does NOT need to be changed. Click the **Add and Edit** button to save changes and exit the Event Handler Wizard.

Object IDs	Message Type
IDC_BRDTYPE	CBN_SELCHANGE
IDC_OPENCARD	BN_CLICKED
IDC_PROG	BN_CLICKED
IDC_RORW	CBN_SELCHANGE
IDC_RORWBUTTON	BN_CLICKED
IDOK	BN_CLICKED



25. The **Class View** tab should now look like something this. Double-click any function declaration to edit that function.

26. Use the code provided on pages 26 to 37 for the member functions. All colored code is new code which you must add to the code generated by the MFC Wizards. Make sure your code matches the code provided.

27. From the menu bar at the top of the screen, click on **Build → Clean CX**. Then click on **Build CX**. If there are no errors, click on the Debug Program button  at the top of the screen again. The program should now allow the user to open a board, execute a flash configuration, and read and write to a specified memory location.

Example MFC Code

Note that the following code is color coded. Black indicates what was added by the ClassWizard, and the colored code is specific to our example. The code segments colored green are comments to help explain the purpose of each section.

```
// CXDlg.cpp : implementation file
//

#include "stdafx.h"
#include "CX.h"
#include "CXDlg.h"
#include <windows.h>
#include "PCICX.h"
#include "PCIErrorCodes.h"



#ifdef _DEBUG
#define new DEBUG_NEW
#endif


// CAboutDlg dialog used for App About

class CAboutDlg : public CDialog
{
public:
 CAboutDlg();

// Dialog Data
 enum { IDD = IDD_ABOUTBOX };

 protected:
 virtual void DoDataExchange(CDataExchange* pDX);    // DDX/DDV support

// Implementation
protected:
 DECLARE_MESSAGE_MAP()
};

CAboutDlg::CAboutDlg() : CDialog(CAboutDlg::IDD)
{
}

void CAboutDlg::DoDataExchange(CDataExchange* pDX)
{
 CDialog::DoDataExchange(pDX);
}

BEGIN_MESSAGE_MAP(CAboutDlg, CDialog)
END_MESSAGE_MAP()


// CCXDlg dialog



CCXDlg::CCXDlg(CWnd* pParent /*=NULL*/)
 : CDialog(CCXDlg::IDD, pParent)
                          , m_Handle(0)
```

```
    , m_BoardType(0)
    , m_AdrMode(0)
    , m_AdrOffset(_T(""))
    , m_CardNum(0)
    , m_FileName(_T(""))
    , m_ReadOrWrite(0)
    , m_WData(0)
{
    m_hIcon = AfxGetApp()->LoadIcon(IDR_MAINFRAME);
}

void CCXDlg::DoDataExchange(CDataExchange* pDX)
{
    CDialog::DoDataExchange(pDX);
    DDX_CBIndex(pDX, IDC_BRDTYPE, m_BoardType);
    DDX_CBIndex(pDX, IDC_ADRMODE, m_AdrMode);
    DDX_Text(pDX, IDC_ADROFF, m_AdrOffset);
    DDX_Text(pDX, IDC_CRDNUM, m_CardNum);
    DDX_Text(pDX, IDC_FILENAME, m_FileName);
    DDX_CBIndex(pDX, IDC_RORW, m_ReadOrWrite);
    DDX_Text(pDX, IDC_TOWRITE, m_WData);
}

BEGIN_MESSAGE_MAP(CCXDlg, CDialog)
    ON_WM_SYSCOMMAND()
    ON_WM_PAINT()
    ON_WM_QUERYDRAGICON()
    //}}AFX_MSG_MAP
    ON_CBN_SELCHANGE(IDC_BRDTYPE,
&CCXDlg::OnCbnSelchangeBrdtype)
    ON_BN_CLICKED(IDC_OPENCARD, &CCXDlg::OnBnClickedOpencard)
    ON_BN_CLICKED(IDC_PROG, &CCXDlg::OnBnClickedProg)
    ON_CBN_SELCHANGE(IDC_RORW, &CCXDlg::OnCbnSelchangeRorw)
    ON_BN_CLICKED(IDC_RORWBUTTON,
&CCXDlg::OnBnClickedRorwbutton)
    ON_BN_CLICKED(IDOK, &CCXDlg::OnBnClickedOk)
END_MESSAGE_MAP()


// CCXDlg message handlers

BOOL CCXDlg::OnInitDialog()
{
    CDialog::OnInitDialog();

    // Add "About..." menu item to system menu.

    // IDM_ABOUTBOX must be in the system command range.
    ASSERT((IDM_ABOUTBOX & 0xFFF0) == IDM_ABOUTBOX);
    ASSERT(IDM_ABOUTBOX < 0xF000);

    CMenu* pSysMenu = GetSystemMenu(FALSE);
    if (pSysMenu != NULL)
    {
        CString strAboutMenu;
        strAboutMenu.LoadString(IDS_ABOUTBOX);
        if (!strAboutMenu.IsEmpty())
        {
            pSysMenu->AppendMenu(MF_SEPARATOR);
            pSysMenu->AppendMenu(MF_STRING, IDM_ABOUTBOX,
strAboutMenu);
        }
```

```
 }

 // Set the icon for this dialog.  The framework does this automatically
 //  when the application's main window is not a dialog
 SetIcon(m_hIcon, TRUE);          // Set big icon
 SetIcon(m_hIcon, FALSE);     // Set small icon

 // TODO: Add extra initialization here

 m_Handle=-1;          //no card handle is in use
 m_CardNum=0;          //assume there is only 1 card
 m_ReadOrWrite=0;         //set read as te first operation
 m_AdrMode=1;          //set the first data size to word
 m_AdrOffset="0000";      //set the original offset to 0x0000
 UpdateData(FALSE);


 return TRUE;  // return TRUE  unless you set the focus to a control
}

void CCXDlg::OnSysCommand(UINT nID, LPARAM lParam)
{
 if ((nID & 0xFFF0) == IDM_ABOUTBOX)
 {
     CAboutDlg dlgAbout;
     dlgAbout.DoModal();
 }
 else
 {
     CDialog::OnSysCommand(nID, lParam);
 }
}

// If you add a minimize button to your dialog, you will need the code below
//  to draw the icon.  For MFC applications using the document/view model,
//  this is automatically done for you by the framework.

void CCXDlg::OnPaint()
{
 if (IsIconic())
 {
     CPaintDC dc(this); // device context for painting

     SendMessage(WM_ICONERASEBKGND, reinterpret_cast<WPARAM>(dc.GetSafeHdc()), 0);

     // Center icon in client rectangle
     int cxIcon = GetSystemMetrics(SM_CXICON);
     int cyIcon = GetSystemMetrics(SM_CYICON);
     CRect rect;
     GetClientRect(&rect);
     int x = (rect.Width() - cxIcon + 1) / 2;
     int y = (rect.Height() - cyIcon + 1) / 2;

     // Draw the icon
     dc.DrawIcon(x, y, m_hIcon);
 }
 else
  {
     CDialog::OnPaint();
  }
}
```

```
// The system calls this function to obtain the cursor to
display while the user drags
//  the minimized window.
HCURSOR CCXDlg::OnQueryDragIcon()
{
    return static_cast<HCURSOR>(m_hIcon);
}



CString CCXDlg::GetStatus(short nStatus)
{
switch(nStatus){
    case OK:
        return "Operation Successful.";
    case ERR_INVALID_HNDL:
return "Error: No board is associated with the specified
handle.";
    case ERR_CARD_IN_USE:
        return "Error: This card is already open.";
    case ERR_NEWDEV:
return "Error:There was a software error while creating this
instance.";
    case ERR_CONNECT:
return "Error: There was an error connecting to this board.";
    case ERR_MAPMEM:
        return "Error: There was a memory mapping error.";
    case ERR_THREAD:
        return "error occurred while creating an interupt.";

    case ERR_ISR_ENABLE:
        return "Error occurred while enableing interrupt
support.";
    case ERR_OUTOFHANDLES:
        return "Error: Too many cards open.";
    case ERR_BAD_PARAM:
        return "Error: Invalid Parameter.";
    case ERR_INSUF_MEM:
        return "Error: Insufficient memory.";
    case ERR_OCX_IN_USE:
return "Error: Control already configured for use by another
device's PCI.";
    case ERR_DLL_LOAD:
        return "Error: ActiveX methods can't load the DLL.";
    case ERR_CONFIG_READ:
return "Error occurred while reading from the device's PCI
configuration.";
    case ERR_TIMEOUT:
        return "Error: Operation timed out before completing.";
    case ERR_CONFIG_SET:
        return "Error: Configuration Failed.";
    case ERR_CALIB:
        return "Error from calibration.";
    case ERR_CONFIG_WRITE:
return "Error occurred when writing to the configuration
space.";
    case ERR_DMA_MAP:
        return "Error: DMA is not mapped into the process.";
    case ERR_EEPROM_ACK:
        return "Error: EEPROM Acknowledge was never recieved.";
    case ERR_EEPROM_READBACK:
        return "Error writing to the EEPROM.";
```

```
 case ERR_FILE_OPEN:
     return "Error: File already opened.";
 case ERR_FILE_FORMAT:
     return "Error:File not the right format.";
 case ERR_FILE_READ:
     return "Error: File cannot be read.";
 case ERR_CONFIG_DONE:
     return "Error: Configuration is not complete.";
 case ERR_EX_DESIGN:
return "Error: FPGA is not configured w//Acromag supplied design.";
 case ERR_HARDWARE:
     return "Error: Hardware malfunction.";
 case ERR_FLASH_BUSY:
     return "Error: Flash chip is busy.";
 case ERR_UNSUPPORTED:
return "Error: Device does not support the requested action.";
 default:
        return "An error has occurred.";
}
return "An error has occurred.";

}

void CCXDlg::OnCbnSelchangeBrdtype()
{
 // TODO: Add your control notification handler code here

 short nStatus=0;             //current status
 short nHandle=-1;            //a temp handle
 WORD wDevID;              //board ID
 BOOL FPGAConfigured;         //is the fpga configured
 int tempBoardType = m_BoardType; //past selected board type
 CString boardName;
UpdateData(TRUE);  //update the member function from the GUI

 //determine which board type was selected
 if(m_BoardType==0){
     wDevID = CX1002R_DEV;
     boardName = "CX1002R";
 }
 else if(m_BoardType==1){
     wDevID=CX2002R_DEV;
     boardName = "CX2002R";
 }
 else if(m_BoardType==2){
     wDevID=CX1003R_DEV;
     boardName = "CX1003R";
 }
 else if(m_BoardType==3){
     wDevID=CX2003R_DEV;
     boardName = "CX2003R";
 }
 else{
     MessageBox("Not a Valid Board Name", "ERROR");
 }

 //check to see if there is more than one card or wDevID type
 //by trying to open a card in slot 1. nStatus will tell us if
//this is a lgega operation, hence there is or isn't a second card
nStatus = PCICX_Open(1,&nHandle,wDevID); //from dll function reference pg9

 if(nStatus==OK){  //there are two or more cards
```

```
        //enable the controls in the GUI for choosing a card
        GetDlgItem(IDC_MULTBRDSTATIC)->EnableWindow(TRUE);
        GetDlgItem(IDC_CRDNUM)->EnableWindow(TRUE);
        GetDlgItem(IDC_OPENCARD)->EnableWindow(TRUE);
    }
    else{             //there is only one card
        //disable the controls in the GUI for choosing a card
        GetDlgItem(IDC_MULTBRDSTATIC)->EnableWindow(FALSE);
        GetDlgItem(IDC_CRDNUM)->EnableWindow(FALSE);
        GetDlgItem(IDC_OPENCARD)->EnableWindow(FALSE);

        //try to open a card in slot one
    nStatus=PCICX_Open(short(0),&nHandle,wDevID);
//from dll function reference g 9
if((nStatus==OK)||(nStatus==ERR_CALIB)){       //if successful
or just call error
           //notify that the board was opened correctly
           MessageBox(boardName="card 0 opened.");
           //assign the temp handle to the global handle
           m_Handle = nHandle;

           //allow user to progrma the FPGA
           GetDlgItem(IDC_PATHSTATIC)->EnableWindow(TRUE);
           GetDlgItem(IDC_FILENAME)->EnableWindow(TRUE);
           GetDlgItem(IDC_PROG)->EnableWindow(TRUE);

           //filename of the mcs file supplied by Acromag
m_FileName="C:\\Program
files\\Acromag\\PCISW_API\\config_files\\"+boardName+".mcs";

           //check to see if configured
//if configured then show already configured text and operation
controls
           PCICX_IsFPGAConfigured(m_Handle,&FPGAConfigured);

//from ll function reference pg70

           if(FPGAConfigured){
               GetDlgItem(IDC_ISFPGACONFIG)->ShowWindow(TRUE);
               GetDlgItem(IDC_OPSTATIC)->ShowWindow(TRUE);
               GetDlgItem(IDC_RORW)->ShowWindow(TRUE);
               GetDlgItem(IDC_ADROFF)->ShowWindow(TRUE);
               GetDlgItem(IDC_ADRSTATIC)->ShowWindow(TRUE);
               GetDlgItem(IDC_ADRMODE)->ShowWindow(TRUE);
               GetDlgItem(IDC_ADRMODESTATIC)->ShowWindow(TRUE);
               GetDlgItem(IDC_RORWBUTTON)->ShowWindow(TRUE);
           }
           else{      //hide the controls
               GetDlgItem(IDC_ISFPGACONFIG)->ShowWindow(FALSE);
               GetDlgItem(IDC_OPSTATIC)->ShowWindow(FALSE);
               GetDlgItem(IDC_RORW)->ShowWindow(FALSE);
               GetDlgItem(IDC_ADROFF)->ShowWindow(FALSE);
               GetDlgItem(IDC_ADRSTATIC)->ShowWindow(FALSE);
               GetDlgItem(IDC_ADRMODE)->ShowWindow(FALSE);
         GetDlgItem(IDC_ADRMODESTATIC)->ShowWindow(FALSE);
         GetDlgItem(IDC_RORWBUTTON)->ShowWindow(FALSE);
       }
       }

           else{
               MessageBox(GetStatus(nStatus)+"\n"+boardName+"
               card 0 failed to open","ERROR");
```

```
            m_BoardType=tempBoardType;
        }
 }
     //update the GUI's variables
     UpdateData(FALSE);


}

void CCXDlg::OnBnClickedOpencard()
{
 // TODO: Add your control notification handler code here
 short nStatus=0;             //status of the dll operation
 short nHandle=-1;            //temp handle
 WORD wDevID;              //id of our board
 BOOL FPGAConfigured;         //is the FPGA configured
 int tempBoardType = m_BoardType; //past board type
 CString temp, boardName;     //temp string, current board
 int tempCardNum=m_CardNum;       //past card number

 UpdateData(TRUE);            //data from the screen

 //close the board opened previously

PCICX_Close(m_Handle); //from the dll function reference pg 10

 //Determine which board type was selected
 if(m_BoardType==0){
     wDevID=CX1002R_DEV;
     boardName="CX1002R";
 }
 else if(m_BoardType==1){
     wDevID=CX1003R_DEV;
     boardName="CX1003R";
 }
 else if(m_BoardType==2){
     wDevID=CX2002R_DEV;
     boardName="CX2002R";
 }
 else if(m_BoardType==3){
     wDevID=CX2003R_DEV;
     boardName="CX2003R";
 }
 else{
     MessageBox("Not a Valid Board Name", "ERROR");

return;
 }

//check the status of opening board 1 in the card number
// m_cardnum

nStatus = PCICX_Open(short(m_CardNum),&nHandle, wDevID);   //dll //function reference
pg 9

 if((nStatus==OK)||(nStatus==ERR_CALIB)){
     //notify that the board was openend correctly
     temp.Format("%d",m_CardNum);
     MessageBox(boardName+"card"+temp+"opened.");
     m_Handle=nHandle; //assign temp handle to global handle

                               //allow GUI access to program the FPGA
```

```
        GetDlgItem(IDC_PATHSTATIC)->ShowWindow(TRUE);
        GetDlgItem(IDC_FILENAME)->ShowWindow(TRUE);
        GetDlgItem(IDC_PROG)->EnableWindow(TRUE);

        //path of the default mcs file
m_FileName =
"C:\\Programfiles\\Acromag\\PCISW_API_WIN\\config_files\\"+boar
dName+".mcs";

        //check to see if board is already configured
        //if configured thens how the configured static text
        //and operation controls

        nStatus =
PCICX_IsFPGAConfigured(m_Handle,&FPGAConfigured);
        //dll function reference pg 70

        if(FPGAConfigured){   //show the r/w controls
            GetDlgItem(IDC_ISFPGACONFIG)->ShowWindow(TRUE);
            GetDlgItem(IDC_OPSTATIC)->ShowWindow(TRUE);
            GetDlgItem(IDC_RORW)->ShowWindow(TRUE);
            GetDlgItem(IDC_ADROFF)->ShowWindow(TRUE);
            GetDlgItem(IDC_ADRSTATIC)->ShowWindow(TRUE);
            GetDlgItem(IDC_ADRMODE)->ShowWindow(TRUE);
            GetDlgItem(IDC_ADRMODESTATIC)->ShowWindow(TRUE);
            GetDlgItem(IDC_RORWBUTTON)->ShowWindow(TRUE);

    }

        else{             //hide the r/w controls
            GetDlgItem(IDC_ISFPGACONFIG)->ShowWindow(FALSE);
            GetDlgItem(IDC_OPSTATIC)->ShowWindow(FALSE);
            GetDlgItem(IDC_RORW)->ShowWindow(FALSE);
            GetDlgItem(IDC_ADROFF)->ShowWindow(FALSE);
            GetDlgItem(IDC_ADRSTATIC)->ShowWindow(FALSE);
            GetDlgItem(IDC_ADRMODE)->ShowWindow(FALSE);
            GetDlgItem(IDC_ADRMODESTATIC)->ShowWindow(FALSE);
            GetDlgItem(IDC_RORWBUTTON)->ShowWindow(FALSE);
        }
    }
    else{                 //if the card can not be opened
        temp.Format("%d", m_CardNum);

MessageBox(GetStatus(nStatus)+"\n"+boardName+"card"+temp+"faile
d to open", "ERROR");

        //switch back to previous board settings

    m_BoardType=tempCardNum;
    }

    UpdateData(FALSE);


}

void CCXDlg::OnBnClickedProg()
{
    // TODO: Add your control notification handler code here

short nStatus;        //status of dll operation
    BOOL FPGAConfigured;     //is fpga configured
```

```
 UpdateData(TRUE);         //data from the GUI

 this ->BeginWaitCursor();//start the hourglass cursor

 nStatus=PCICX_IsFPGAConfigured(m_Handle,&FPGAConfigured);
//from dll reference pg70

if(nStatus !=ERR_INVALID_HNDL){   //it is possible to program //this handle
//do a flash configuration

     nStatus=PCICX_FlashConfigure(m_Handle,m_FileName);           //from dll reference
pg 72

 if(nStatus==OK){
     MessageBox(GetStatus(nStatus));

     //enable the r/w operations
     GetDlgItem(IDC_OPSTATIC)->ShowWindow(TRUE);
     GetDlgItem(IDC_RORW)->ShowWindow(TRUE);
     GetDlgItem(IDC_ADROFF)->ShowWindow(TRUE);
     GetDlgItem(IDC_ADRSTATIC)->ShowWindow(TRUE);
     GetDlgItem(IDC_ADRMODE)->ShowWindow(TRUE);
     GetDlgItem(IDC_ADRMODESTATIC)->ShowWindow(TRUE);
     GetDlgItem(IDC_RORWBUTTON)->ShowWindow(TRUE);
 }
 else{
MessageBox("Configuration did not complete. \n Check your path name and try again",
"ERROR");
 }
}

else{   //error with usig this handle
     MessageBox(GetStatus(nStatus),"ERROR");

     //force user to open a new card from the beginning
     GetDlgItem(IDC_PATHSTATIC)->EnableWindow(FALSE);
     GetDlgItem(IDC_FILENAME)->EnableWindow(FALSE);
     GetDlgItem(IDC_PROG)->EnableWindow(FALSE);
     GetDlgItem(IDC_ISFPGACONFIG)->ShowWindow(FALSE);
     GetDlgItem(IDC_OPSTATIC)->ShowWindow(FALSE);
     GetDlgItem(IDC_RORW)->ShowWindow(FALSE);
     GetDlgItem(IDC_ADROFF)->ShowWindow(FALSE);
     GetDlgItem(IDC_ADRSTATIC)->ShowWindow(FALSE);
     GetDlgItem(IDC_ADRMODE)->ShowWindow(FALSE);
     GetDlgItem(IDC_ADRMODESTATIC)->ShowWindow(FALSE);
     GetDlgItem(IDC_RORWBUTTON)->ShowWindow(FALSE);

     //close the board if there is a handle
     if(m_Handle !=-1){

PCICX_Close(m_Handle); //from the dll reference pg 10
         m_Handle=-1;
     }
 }

}

void CCXDlg::OnCbnSelchangeRorw()
{
 // TODO: Add your control notification handler code here
```

```
UpdateData(TRUE);

    if(m_ReadOrWrite==0){     //drop down is read
        GetDlgItem(IDC_TOWRITE)->ShowWindow(FALSE);
        GetDlgItem(IDC_WRITESTATIC)->ShowWindow(FALSE);
        GetDlgItem(IDC_RORWBUTTON)->SetWindowText("Read");
    }
    else{                 //drop down is write
        GetDlgItem(IDC_TOWRITE)->ShowWindow(TRUE);
        GetDlgItem(IDC_WRITESTATIC)->ShowWindow(TRUE);
        GetDlgItem(IDC_RORWBUTTON)->SetWindowText("Write");
    }


}

void CCXDlg::OnBnClickedRorwbutton()
{
    // TODO: Add your control notification handler code here

DWORD data;               //what to read from the card
    short nStatus;        //status of the dll operation
    CString str;          //temp string
    DWORD adr;            //address
    short len;            //length of the DWORD that is read
    char *delim;          //dummy pointer for conversions

    UpdateData(TRUE);     //update variables

    //convert m_AdrOffset froma string hex number to DWORD
    adr=(DWORD)strtol(m_AdrOffset,&delim,16);
    if(m_ReadOrWrite==0){ //read
        switch(m_AdrMode){
            case 0:       //read a byte

    nStatus=PCICX_ReadByte(m_Handle,CX_PCIBAR2,adr,(PBYTE)&data
);
                len=2;
                break;
            case 1:       //read a word

    nStatus=PCICX_ReadWord(m_Handle,CX_PCIBAR2,adr,(PWORD)&data
);
                len=4;
                break;
            case 2:       //read a Dword

    nStatus=PCICX_ReadDword(m_Handle,CX_PCIBAR2,adr,&data);
                len=8;
                break;
            default:
                nStatus=ERR_BAD_PARAM;
                break;
        }

        if(nStatus==OK){  //if read correctly
            str.Format("%X",data);   //change data to hex
str=str.Right(len);   //a substring which length depends on
_AdrMode

            //replace the leading zero that right() took off
            while(len==8&&str.GetLength()<8){
```

```
            str="0"+str;
        }
        MessageBox("Value read:"+str); //display the read
    }
    else{
        MessageBox(GetStatus(nStatus),"ERROR");
    }
}
else{             //write
    switch(m_AdrMode){
    case 0:       //write a byte
        nStatus=PCICX_WriteByte(m_Handle,CX_PCIBAR2,adr,(BYTE)&data);
        len=2;
        break;
    case 1:       //write a word
        nStatus=PCICX_WriteWord(m_Handle,CX_PCIBAR2,adr,(WORD)&data);
        len=4;
        break;
    case 2:       //write a dword
        nStatus=PCICX_WriteDword(m_Handle,CX_PCIBAR2,adr,m_WData);
        len=8;
        break;
    default:
        nStatus=ERR_BAD_PARAM;
        break;
    }

    //display if status of write
    if(nStatus==OK)
        MessageBox(GetStatus(nStatus));
    else
        MessageBox(GetStatus(nStatus), "ERROR");
}

}

//called when the OK button is pressed
//
//operations : closes the open board and the program
void CCXDlg::OnBnClickedOk()
{
 // TODO: Add your control notification handler code here

 //close the board that is in use
 PCICX_Close(m_Handle);       //from dll function reference pg 10

 OnOK();
}
```